REPORT

SpareBank 1 Nord-Norge Green Portfolio Impact Assessment FY 2022

CLIENT

SpareBank 1 Nord-Norge

SUBJECT

Impact assessment- energy efficient residential and commercial buildings, electric vehicles, and renewable energy

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CLIENT	**SpareBank 1 Nord-Norge**	PROJECT MANAGER	Ibrahim Temel
CONTACT	Ronny Løvberg Sørensen	PREPARED BY	Ibrahim Temel, Kjersti Rustad Kvisberg
		RESPONSIBLE UNIT	10105080 Renewable Energy Advisory Services

In summary, impact assessed for all examined asset classes in the SpareBank 1 Nord-Norge portfolio qualifying according to the bank's Green Bond Framework is dominated by renewable energy but with significant contributions from all asset classes.

The total impact of the assets in the portfolio is almost 123,000 tonnes CO_2e/year:

Energy efficient residential buildings	*6,830 tonnes CO_2e/year*
Energy efficient commercial buildings	*5,906 tonnes CO_2e/year*
Clean transportation	*1,301 tonnes CO_2e/year*
Renewable energy	*108,944 tonnes CO_2e/year*
Total	***122,981 tonnes CO_2e/year***

Note that for clean transportation, the impact is the sum of 2,202 tonnes CO_2e/year Scope 1 emissions, and -901 tonnes CO_2e/year in Scope 2 emissions based on European power mix.

Impact for energy efficient buildings scaled by the bank's share of financing can be found in the relevant sections.

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1 Introduction

Assignment

On assignment from SpareBank 1 Nord-Norge, Multiconsult has assessed the impact of the part of the bank's loan portfolio eligible for green bonds according to SpareBank 1 Nord-Norge's Green Bonds Framework[1].

In this document we briefly describe SpareBank 1 Nord-Norge's green bond qualification criteria, the evidence for the criteria and the result of an analysis of the loan portfolio of SpareBank 1 Nord-Norge. More detailed documentation on baseline, methodologies and eligibility criteria is made available on the bank's website[1].

1.1 CO_2 emission factors related to electricity demand and production

The eligible assets are either producing renewable energy and delivering into the existing power system or using electricity from the same system. The energy consumption of Norwegian buildings is also predominantly electricity, with some district heating and bioenergy. The share of fossil fuel is very low and declining.

As shown in Figure 1, the Norwegian production mix in 2022 (88 percent hydropower and 10 percent wind) results in emissions of 7 gCO_2/kWh. The production mix is also included in the figure for other selected European states for illustration.

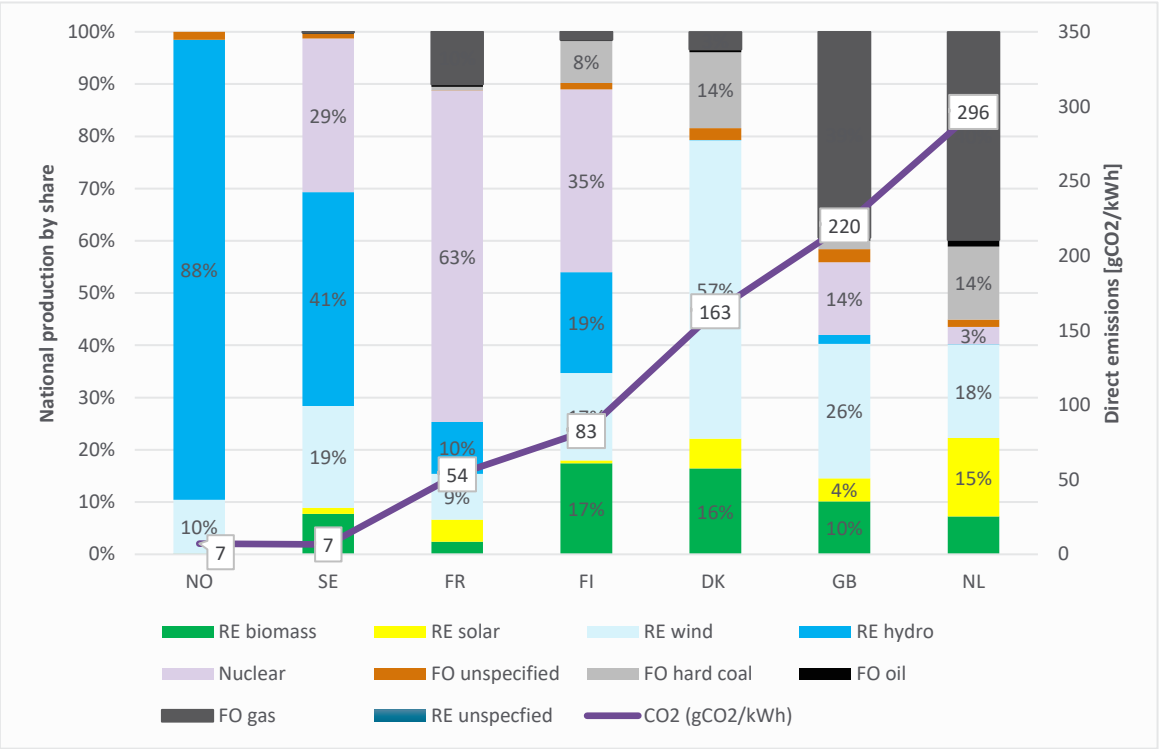

Figure 1 National electricity production mix in some selected countries (European Residual Mixes 2022, Association of Issuing Bodies[2])

[1] https://www.sparebank1.no/nb/nord-norge/om-oss/baerekraft/rammeverk-for-gronne-obligasjoner.html
[2] https://www.aib-net.org/facts/european-residual-mix

Power is traded internationally in an ever more interconnected European electricity grid. For impact calculations, the regional or European production mix is more relevant than national production. Using a life-cycle analysis, the Norwegian Standard NS 3720:2018 "Method for greenhouse gas calculations for buildings" takes into account international electricity trade and that the consumption is not necessarily equal to domestic production. The grid factor, as average in the lifetime of an asset, is based on a trajectory from the current grid factor to a close to zero emission factor in 2050 and steady until the end of the lifetime.

The mentioned standard calculates, on a life-cycle basis, the average CO_2 factor for the next 60 years, a lifetime relevant for buildings and renewable energy assets, according to two scenarios as described in Table 1.

Table 1 Electricity production greenhouse gas factors (CO_2- equivalents) for two scenarios. (Source: NS 3020:2018, Table A.1)

Scenario	CO_2 emission factor
European (EU27 + UK + Norway) electricity mix	136 gCO_2/kWh
Norwegian electricity mix	18 gCO_2/kWh

The impact calculations in this report apply the European mix in Table 1. This is in line with Nordic Public Sector Issuers: Position Paper on Green Bonds Impact Reporting (February 2020)[3].

Applying the factor based on EU27 + UK + Norway energy production mix, the resulting CO_2 emission factor for Norwegian residential buildings, including the influence of bioenergy and district heating in the energy mix[4], is on average 115 gCO_2/kWh. This factor is used in impact calculations in sections 2, 3 and 5.

The average emission factor relevant for electric vehicles is instead calculated based on the last three-year average for the European production mix. This is described in more detail in section 4.

For the calculations of impact for renewable energy in section 5, the emission factors from **Error! Reference source not found.** are used as a baseline.

[3] https://www.kbn.com/globalassets/dokumenter/npsi_position_paper_2020_final_ii.pdf
[4] Multiconsult on assignment from DiBK, 2015.

2 Energy efficient residential buildings

2.1 Eligibility criteria

In this impact assessment eligible Residential Green Buildings for SpareBank 1 Nord-Norge must meet one of the following eligibility criteria:

Building code criterion

New or existing Norwegian residential dwellings that comply with the Norwegian building code of 2010 (TEK10) or later codes. Hence, built in 2012 and later.

Over the last several decades, the changes in the building code have pushed for more energy efficient buildings. Combining the information on the calculated energy demand related to building code and information on the residential building stock, the calculated average specific energy demand on the Norwegian residential building stock is 251 kWh/m^2. Building code TEK10 and TEK17 gives an average specific energy demand for existing houses and apartments, weighted for actual stock, of 114 kWh/m^2.

Hence, compared to the average residential building stock, the building code TEK10 and TEK17 gives a calculated specific energy demand reduction of 54 percent.

EPC criterion

Existing Norwegian residential buildings built using older building codes than TEK10 with EPC-labels A and B.

As only half of all dwellings have a registered EPC, the available data have been extrapolated, assuming the registered dwellings are representative for their age group regarding energy label. Then the EPC data indicates that 7.5 percent of the current residential buildings in Norway will have a B or better. According to the EPC system, the average energy performance of a dwelling relates to an energy label E. The system boundary in the Norwegian EPC system differs from the one used in the building code (EPC uses delivered energy and not gross energy demand). For impact assessments, the building code baseline is based on the EPC statistics, where the average dwelling gets an E.

Combination of criteria

The two criteria are based on different statistics. It is however interesting to view them in combination. Table 2 illustrates how the criteria, independently and in combination, make up cumulative percentages.

Interpretation: TEK10 and newer in isolation represents 12.4 percent; TEK10 and newer in combination with A+B labels represents 13.8 percent; TEK10 and newer in combination with A+B+C labels represents 18.2 percent.

Table 2 Matrix of Cumulative percentages for criteria combinations (FY22), relative to the total residential building stock in Norway.

	TEK10 + TEK17	**A + B**	**A + B + C**
TEK10 + TEK17	12.4 percent	13.8 percent	18.2 percent
A + B		8.4 percent	
A + B + C			16.9 percent

The SpareBank 1 Nord-Norge green bond framework also has a refurbishment criterion. This is not considered in this assessment.

2.2 Impact assessment - Residential buildings

The 3,534 eligible residential buildings in SpareBank 1 Nord-Norge's portfolio are estimated to amount to 440,776 square meters. The bank has supplied reliable information on the objects in the portfolio, including area and registered or estimated energy grade. The number of eligible objects and qualifying areas per qualifying building code and EPC are shown below in Table 3. All these residential buildings are not necessarily included in one single bond issuance.

Table 3 Number of eligible objects and calculated building areas qualifying for each criterion.

	No. of units qualifying buildings in portfolio				Area qualifying buildings in portfolio [m^2]				
	TEK17	TEK10	EPC A	EPC B	TEK17	TEK10	EPC A	EPC B	Total
Apartments	793	925	3	35	57,105	71,368	211	2,619	**131,303**
Small residential houses	630	1,072	7	69	109,392	184,871	1,593	13,617	**309,473**
Total	**1,423**	**1,997**	**10**	**104**	**166,497**	**256,239**	**1,804**	**16,236**	**440,776**

Energy efficiency for the buildings in the portfolio is calculated based on the respective criteria. For the buildings eligible under the building code criterion, the difference between average specific energy demand for each sub-category in the building stock and the average for qualifying buildings is used. For the buildings qualifying according to the EPC-criterion, the calculations are based on the difference between achieved energy label and weighted average in the EPC database.

To calculate the impact on climate gas emissions, the decreasing trajectory toward 2050 is applied to all electricity consumption in all buildings. Electricity is the dominant energy carrier to Norwegian buildings, but the energy mix also includes bio energy and district heating, resulting in a total specific emission factor of 115 gCO_2eq/kWh. A proportional relationship is expected between energy consumption and emissions.

Table 4 indicates how much more energy efficient the eligible part of the portfolio is compared to the average residential Norwegian building stock. It also presents how much the calculated reduction in energy demand constitutes in CO_2-emissions.

The impact is also presented scaled by the bank's engagement, which is the FY 2022 loan balance share of building value.

Table 4 Performance of eligible objects compared to average residential building stock.

	Area	Avoided energy compared to baseline	Avoided CO_2 emissions compared to baseline
Buildings eligible under the building code	422,736 m^2	57.6 GWh	6,614 tonnes CO_2/year
Buildings eligible under the EPC criterion	18,040 m^2	1.9 GWh	216 tonnes CO_2/year
Total eligible residential buildings in portfolio	**440,776 m^2**	**59.5 GWh**	**6,830 tonnes CO_2/year**
Total eligible residential buildings in portfolio – scaled by bank's engagement	**196,468 m^2**	**26.5 GWh**	**3,043 tonnes CO_2/year**

3 Energy efficient commercial buildings

3.1 Eligibility criteria

The SpareBank 1 Nord-Norge eligibility criteria for commercial buildings considered in this impact assessment is the building code criterion described below and buildings with an EPC A or B.

Building code criterion

New or existing commercial buildings belonging to the top 15 percent low carbon buildings in Norway:

i. **New or existing Norwegian hotel and restaurant buildings that comply with the Norwegian building codes TEK07, TEK10, TEK17 or later building codes. Hence, finished in 2011 and later.**

ii. **New or existing Norwegian office, retail and industrial buildings and warehouses that comply with the Norwegian building TEK07, TEK10, TEK17 or later building codes. Hence, finished in 2010 and later.**

Multiconsult uses the following criteria to identify the eligible buildings:

1. **Norwegian commercial buildings that comply with the Norwegian building code of 2010 (TEK10) and later codes** are eligible for green bonds as these buildings have significantly better energy standards and account for less than 15 percent of the commercial building stock.
    a. For **office buildings, retail buildings, industrial buildings and warehouses**, a two-year lag between the implementation of a new building code and the buildings built under that code must be taken into account. Hence all **buildings finished in 2012 or later qualify**.
    b. For **hotel and restaurant buildings**, a three-year lag between implementation of a new building code and the buildings built under that code must be taken into account. Hence all **buildings finished in 2013 or later qualify**.
2. **Existing Norwegian commercial buildings with EPC labels A or B.** These buildings may be identified by using data from the Energy Performance Certificate (EPC) database.

Since the building code criteria was established, the building stock has grown, and the new buildings are entering the top 15 percent. For the sub-categories' office and retail, hotel and restaurant buildings combined the buildings complying with TEK07 and later codes are currently 11 percent of the total. Small industry and warehouses, however, where the newbuild rate has been very high the last years, are now past 16 percent. This indicates the need to move the criterion for commercial buildings, to only include TEK10 and TEK17.

Combining the information on the calculated specific energy demand related to building code and information on the commercial building stock, the calculated average specific energy demand on the part of the Norwegian building stock examined is presented in the table below. The table also presents the average specific energy demand for the younger and qualifying part of the building stock and the relative reduction in energy demand.

Table 5 Average specific energy demand for the building stock; whole stock, part eligible according to criteria and percentage reduction (Source: SSB, historic cuilding codes, Multiconsult).

	Average total stock	Average TEK10, TEK17	Reduction
Office buildings	246 kWh/m^2	139 kWh/m^2	43 percent
Commercial buildings	318 kWh/m^2	201 kWh/m^2	37 percent
Hotel buildings	327 kWh/m^2	209 kWh/m^2	36 percent
Small industry and warehouses	285 kWh/m^2	160 kWh/m^2	44 percent

The SpareBank 1 Nord-Norge green bond framework also has a refurbishment criterion and a criterion based on certification schemes such as BREEAM-NOR. These are not considered in this assessment.

3.2 Impact assessment - Commercial buildings

The eligible buildings in SpareBank 1 Nord-Norge's commercial portfolio are estimated to amount to ~422,000 square meters. 266 objects are found eligible according to the building code criterion. One building with EPC B is found eligible according to the EPC criterion.

The bank has supplied reliable information on the objects in the portfolio, including building year, area and registered or estimated energy grade.

For buildings eligible under the building code criterion, the reduction energy demand from the average of the total commercial building stock to the average for eligible building codes is multiplied by the emission factor and area of eligible assets to calculate the impact for buildings.

Table 6 Calculated building areas for the eligible objects.

	TEK17	TEK10	EPC A/B	Total
Office buildings	5,721 m^2	20,043 m^2	9,326 m^2	35,090 m^2
Retail/commercial buildings	73,449 m^2	105,605 m^2		179,054 m^2
Hotel and restaurant buildings	8,341 m^2	15,537 m^2		23,878 m^2
Industry and small warehouse buildings	90,083 m^2	93,789 m^2		183,872 m^2
Total	**177,593 m^2**	**234,974 m^2**	**9,326 m^2**	**421,893 m^2**

To calculate the impact on climate gas emissions, the trajectory is applied to all electricity consumption in all buildings. Electricity is the dominant energy carrier to Norwegian buildings, but the energy mix also includes bio energy and district heating, resulting in a total specific factor of 115 gCO_2eq/kWh. A proportional relationship is expected between energy consumption and emissions.

Table 7 indicates how much more energy efficient the eligible part of the portfolio is compared to the average residential Norwegian building stock. It also presents how much the calculated reduction in energy demand constitutes in CO_2 emissions. The impact is also presented scaled by the bank's engagement, which is the FY 2022 loan balance share of building value.

Table 7 Performance of eligible objects compared to average building stock.

	Area	Reduced energy compared to baseline	Reduced CO_2 emissions compared to baseline
Eligible commercial buildings in portfolio	**421,893 m^2**	**51.4 GWh/year**	**5,906 tonnes CO_2/year**
Eligible commercial buildings in portfolio – scaled by banks engagement	**230,766 m^2**	**28.5 GWh/year**	**3,268 tonnes CO_2/year**

4 Electric vehicles

The impact of electric vehicles in Norway on climate gas emissions is assessed in the following. The bank's portfolio as of the end of December 2022 consisted of 3,042 electric vehicles. The bank has provided data on the number of electric vehicles in the portfolio per registration year.

The identified eligible vehicles in the portfolio all align with the technical eligibility criteria formulated by Climate Bonds Initiative (CBI)[5]. The eligible EVs/ zero tailpipe emissions vehicles in the portfolio are also automatically eligible according to the climate change mitigation criteria in the EU Taxonomy Delegated Acts[6].

The portfolio is assessed regarding direct emissions (Scope 1) and indirect emissions related to electric power production (Scope 2). A baseline is established as the emission of the average vehicle of the total new vehicle introduced to the market, EV's excluded.

4.1 Loan Portfolio Analysis

Related to clean transportation, the SpareBank 1 Nord-Norge Green Product Framework has several eligibility criteria for Green Financing Instruments. This report, however, investigates the electric vehicle portfolio and the relevant criterion:

- Upgrading or replacement of vehicles for land passenger and freight transport with new fully electric, hydrogen-based or otherwise zero emission technology

The portfolio examined includes solely electric vehicles financed by the bank, and the calculations include passenger vehicles and light-duty vehicles.

4.2 General description EVs

Personal mobility in Norway is high, among the highest in Europe, with privately owned passenger vehicles accounting for most of the passenger transportation work.

Historical figures of how far the average passenger vehicle is driven annually in Norway, show a falling slope from 2007 and 2008, when the passenger vehicles peaked and were on average driven about 14,000 km. In 2022 the average passenger vehicle travelled about 11,100 km[7] in Norway. In this analysis, the expected yearly travelled distance for the vehicles in the portfolio is estimated based on an expectation of a continuing trend of reduced yearly travelled distance, and as an average in the vehicles' lifetime.

In 2022 the average age of passenger vehicles scrapped for refund in Norway was 18 years old[8]. The average age for vans scrapped in Norway was 16 years in 2022[8]. The history of modern EV's is short and there is yet no evidence for the lifetime of EV's being different from other vehicles. Due to uncertainties related to the expected lifetime of new vehicles sold between 2013 and 2022, the average lifetime for passenger vehicles and light-duty vehicles in this analysis are set to 18 and 16 years respectively, independent of fuel type.

The Norwegian government have, over time, with different administrations, had high ambitions both regarding electric vehicles and biofuel to reduce CO_2 emissions. There were almost 600,000 electric passenger vehicles on Norwegian roads by the end of 2022, which accounts for 20 percent of the total

[5] https://www.climatebonds.net/standard/transport
[6] https://ec.europa.eu/info/law/sustainable-finance-taxonomy-regulation-eu-2020-852/amending-and-supplementary-acts/implementing-and-delegated-acts_en
[7] SSB Road traffic volumes, by main type of vehicle, type of fuel and age of vehicle 2005 - 2022, 2023
[8] https://www.ssb.no/en/statbank/table/05522

passenger vehicle stock[9]. The Norwegian Parliament have unanimously adopted a target of 100 percent of sales of zero-emission light-duty and passenger vehicles from 2025.[10]

Since 2018, petrol retailers are obliged to sell biofuels as a defined percentage of their total sales of ordinary petroleum products. This obligation was 24.5 percent in 2022, whereof a share of minimum 9 percent should be advanced biofuel. To incentivise the use of advanced biofuels, one litre of advanced biofuels counted as two litres of conventional biofuel. The overall use of advanced biofuel has increased year after year and in 2022, advanced biofuels accounted for 94 percent of the overall biofuel usage, thus reducing the usage of conventional biofuels[11]. As a result, the overall volume of biofuel has declined the past years, even though the percentage of biofuels has increased. The current government platform ("Hurdalsplattformen") strengthens the obligations to utilize second-generation biofuels in the fuels sold[12].

4.3 Climate gas emissions (Scope 1 and 2)

Categorizing the emissions, we have chosen to use the CBI guidelines for Scope 1 and Scope 2 emission calculations. CBI's *Land Transport Background Paper*[13] underlines the focus on tailpipe emissions because of their dominance, the need to send strong signals to vehicle purchasers and the need to promote technologies and infrastructure that have the potential to radically shift emissions trajectories and avoid fossil fuel lock-in. We do, however, include indirect emissions related to power production for information.

4.3.1 Indicators

In this analysis, we are using two relevant climate gas emission indicators for vehicles:

- Emissions per kilometre [gCO_2/km]
- Emissions per passenger kilometre [gCO_2/pkm]

The passenger vehicle fleet composition and emissions from the types of passenger vehicles are used to calculate the emissions per kilometre.

A passenger-kilometre, abbreviated as pkm, is the unit of measurement representing the transport of one passenger over one kilometre. Passenger kilometers are calculated by multiplying the number of passengers by the corresponding number of kilometers travelled.

Statistics Norway's method for calculating indicators for emissions per passenger kilometre utilizes a vehicle occupancy of 1.7 persons in passenger vehicles and 1.5 persons in a light-duty vehicle, and these factors have been adopted in this analysis[14].

4.3.2 Direct emissions (tailpipe) - Scope 1

Under scope 1, we calculate the "Direct tailpipe CO_2 emissions from fossil fuels combustion" avoided.

The estimation of the baseline is performed through three steps:

1. Estimating the gross CO_2-emission per km (c) from the average vehicle that is being substituted by the zero-emission vehicle.

[9] SSB 07849: Drivstofftype, type kjøring og kjøretøygrupper (K) 2008 - 2022
[10] https://www.regjeringen.no/no/tema/transport-og-kommunikasjon/veg_og_vegtrafikk/faktaartikler-vei-og-ts/norge-er-elektrisk/id2677481/
[11] https://www.miljodirektoratet.no/aktuelt/nyheter/2023/mai-2023/mer-frityrolje-og-slakteavfall-pa-tanken-i-2022/
[12] https://res.cloudinary.com/arbeiderpartiet/image/upload/v1/ievv_filestore/43b0da86f86a4e4bb1a8619f13de9da9afe348b29bf24fc8a319ed9b02dd284e
[13] https://www.climatebonds.net/files/files/CBI_Background%20Doc_Transport_Jan2020%20.pdf page 25
[14] https://www.ssb.no/transport-og-reiseliv/artikler-og-publikasjoner/mindre-utslipp-per-kjorte-kilometer

2. Multiplied by the number of km (d) the vehicle is estimated to travel.
3. Multiplied by the number (n) of vehicles substituting fossil vehicles in the portfolio.

This can be described in the following equation:

$$E_{baseline} = c_{weighted\ average} \cdot d_y \cdot n_{total} = E_{avoided} \quad (1)$$

All EVs and fuel cell vehicles are considered eligible with zero tailpipe emissions. Therefore, for scope 1 calculations, the emissions from these vehicles are set to zero, and the baseline will amount to the total avoided emissions.

To estimate the annual emissions avoided by the eligible assets, projections are made for direct tailpipe CO_2-emissions from fossil fuels combustion in the national vehicle fleets.

For the substituted fossil-fuelled vehicles, emission data are retrieved from recognized test methods and not actual registrations of emissions in a Nordic climate. Test methods have lately been improved to better reflect actual emissions but are still likely to underestimate the emissions[15].

Biofuels are already to some degree mixed with fossil fuels in both Norway and Sweden, and the reduced emissions due to these contributions are considered in the emissions from the vehicle that would have been bought as an alternative for the electric vehicle in this portfolio, in effect reducing the impact. As Norway aims to substantially reducing emissions from fossil fuelled vehicles by using biofuel in the fuel sold before 2030, the marginal emission reduction possibly obtained through these political goals between 2022-2030 have been accounted for in the analysis. It is assumed that the biofuel share in the fuel mix will remain constant between 2030 and the end of the vehicles' lifetime, assumed to be in 2039 and 2037 for passenger vehicles and light-duty vehicles registered in 2022, respectively.

To estimate the weighted average of emissions per fossil vehicle ($c_{weighted\ average}$) we use the average annual emission from new vehicle models from 2011-2022[16].

To estimate the distance travelled by the average vehicle we assume that EVs drive the average of the total vehicle portfolio for each vehicle type for each of the years it is used in its lifetime. Statistics of annual driven distance by electric, diesel and gasoline cars younger than 10 years builds up under this assumption[17].

Traffic volumes per passenger vehicle and light-duty vehicle have shown a historic decline and we use linear regression on publicly available datasets (d_{2005}-d_{2022}) and extrapolate until 2040. This is a conservative approach as it is likely, at some point, to see a flattening.

Table 8 and Table 9 present the calculated direct emission factors for the relevant vehicle categories. The calculations are based on emissions statistics between 2011-2022, calculated gross tailpipe CO_2 emissions for the average vehicle produced in each of the years 2011-2022, and anticipated biofuel- and fossil fuel content in petrol/diesel pumped each year in 2022-2040.

[15] https://www.vegvesen.no/fag/fokusomrader/miljo+og+omgivelser/klima
[16] https://ofv.no/CO2-utslippet/co2-utslippet
[17] https://www.ssb.no/statbank/table/12578/

*Table 8 **Passenger vehicles:** Greenhouse gas emission factors (CO_2 equivalents), average direct emissions.*

	Direct emissions substituted fossil passenger vehicles – Average	Direct emissions EV
Emissions per passenger km	46 gCO_2/pkm	0 gCO_2/pkm
Emissions per km	78 gCO_2/km	0 gCO_2/km
Emissions per passenger vehicle and year	691 $kgCO_2$/vehicle/year	0 $kgCO_2$

*Table 9 **Light-duty vehicles:** Greenhouse gas emission factors (CO2- equivalents), average direct emissions.*

	Direct emissions substituted fossil light-duty vehicles – Average	Direct emissions EV
Emissions per passenger km	133 gCO_2/pkm	0 gCO_2/pkm
Emissions per km	200 gCO_2/km	0 gCO_2/km
Emissions per light-duty vehicle and year	2,300 $kgCO_2$/vehicle/year	0 $kgCO_2$

4.3.3 Indirect emissions (Power consumption only) - Scope 2

Power is traded internationally in an ever more interconnected European electricity grid. For impact calculations of all power consumption, and even electrification of transportation, the regional or European production mix is more relevant than the national power production mix and is the basis for the analysis. Using a European production mix is in line with Nordic Public Sector Issuers: Position Paper on Green Bonds Impact Reporting (February 2020)[18]. We have, however, also included calculations of indirect emissions from power production setting the system boundary at national borders for comparison.

The direct emissions in power production in Europe (EU27+UK+Norway) is expected to be dramatically reduced in the coming decades. Due to urgency, a trajectory takes into consideration the 1.5 °C scenario and a substantial reduction of emissions in the power sector that will have close to zero emissions in 2050. This is in line with the EU's ambitious decarbonisation of the power sector.

The GHG emission intensity baseline for power consumption may be calculated with different system boundaries. The table below illustrates the CO_2 emission factor for the European and Norwegian production mixes as an average of the three last years with available data. These values will vary from year to year.

Table 10 Electricity production greenhouse gas factors (CO_2- equivalents). (Source: Association of Issuing Bodies, Multiconsult)

Scenario	CO_2 emission factor
European (EU27+UK+Norway) production mix average 2020- 2022	241 gCO_2/kWh
Norwegian production mix average 2020- 2022	6.4 gCO_2/kWh

The following calculations use the CO_2 emission factor as an average from a baseline in 2022 (the production mixes in Table 10) and the expected lifetime for each type of vehicle. E.g., for European production mix and passenger vehicles, with an expected lifetime of 18 years, the reduction over the vehicle's lifetime gives the applied average factor of 168 gCO_2/kWh. The projected trajectories for

[18] https://www.kbn.com/globalassets/dokumenter/npsi_position_paper_2020_final_ii.pdf

declining CO_2 emissions related to power production for EU and Norway, from 2022 and forward, will impact the indirect emissions and avoided emissions from the vehicle portfolio.

The energy consumption of EVs is very much dependent on size and outdoor temperature. There is not sufficient available data to ensure an accurate estimation of energy consumption for the average EV. In these calculations, we are using the average for all currently available EV models in the Electrical Vehicle Database[19], 0.195 kWh/km, which is close to the factor presented in the Swedish "Handbok för vägtrafikens luftföroreningar"[20]. This factor has been used in the analysis. The same handbook presents an energy consumption for light-duty vehicles of 0.25 kWh/km.

In Table 11 and Table 12, indirect emission factors are presented in both emissions per kilometre and per passenger-kilometre.

*Table 11 Annual average electricity consumption greenhouse gas factors (CO_2- equivalents) electric vehicles- based on **EU + UK + NO** power production mix*.*

	Electric passenger vehicle	Electric light-duty vehicle
Emissions per passenger-km, indirect emissions from power production	19 gCO_2/pkm	30 gCO_2/pkm
Emissions per km, indirect emissions from power production	33 gCO_2/km	44 gCO_2/km

*Table 12 Annual average electricity consumption greenhouse gas factors (CO2- equivalents) electric vehicles- based on **Norwegian** power production mix*.*

	Electric passenger vehicle	Electric light-duty vehicle
Emissions per passenger-km, indirect emissions from power production	0.5 gCO_2/pkm	0.8 gCO_2/pkm
Emissions per km, indirect emissions from power production	0.9 gCO_2/km	1.2 gCO_2/km

*Note that there are indirect emissions related to fossil fuel as well, but these are scope 3 emissions and not included in this analysis. Scope 3 emissions differ between fossil and electric vehicles mostly due to the batteries where there is rapid technology development. Indirect emissions related to fossil fuelled vehicles are zero for scope 2.

4.4 Impact assessment – Clean transportation

The 3,042 eligible vehicles in SpareBank 1 Nord-Norge's FY23 portfolio are estimated to drive 27.2 million kilometres in a year. The available data from the bank include the current number of contracts and related portfolio volume per registration year.

Table 13 Number of eligible vehicles and expected yearly mileage.

	No. of vehicles	Sum distance [km/year]	Sum distance [pkm/year]
Passenger vehicles	2,980	26.5 million	45.1 million
Light-duty vehicles	62	0.7 million	1 million
Sum portfolio	**3,042**	**27.2 million**	**46.1 million**

Table 14 and Table 15 summarises the lower CO_2-emissions compared to baseline for the eligible assets in the portfolio in an average year in the lifetime of the vehicles in the portfolio, presented as

[19] https://ev-database.org/cheatsheet/energy-consumption-electric-car
[20] Handbok för vägtrafikens luftföroreningar, chapter 6, Trafikverket, 2019

reductions in direct emissions and indirect emissions in rounded numbers. Table 14 present results based on European power production mix, and Table 15 for Norwegian production mix for vehicles belonging to the respective countries. Note that the indirect emissions are only calculated for EV's and not fossil fuelled vehicles.

Direct emissions in the following tables are calculated by multiplying distance travelled by the vehicles in the portfolio in a year from Table 13, by the specific emission factors [gCO_2/km] in Table 8 through Table 9. Indirect emissions are calculated by multiplying distance travelled by the vehicles in the portfolio in a year by the specific emission factors [gCO_2/km] in Table 11 and Table 12 for European and Norwegian production mixes, respectively. Note that emissions have not been scaled by the bank's share of financing.

Table 14 The EV portfolio's estimated impact on direct, indirect, and in total avoided GHG emissions in rounded numbers, indirect emissions based on European production mix.

Eligible passenger vehicles	CO_2 emissions avoided compared to baseline
Direct emissions only (Scope 1)	2,202 tonnes CO_2/year
Indirect emissions only (Scope 2, EU mix)	- 901 tonnes CO_2/year
Sum direct and indirect	**1,301 tonnes CO_2/year**

Table 15 The EV portfolio's estimated impact on direct, indirect, and in total avoided GHG emissions in rounded numbers, indirect emissions based on Norwegian production mix.

Eligible passenger vehicles	CO_2 emissions avoided compared to baseline
Direct emissions only (Scope 1)	2,202 tonnes CO_2/year
Indirect emissions only (Scope 2, NO mix)	- 24 tonnes CO_2/year
Sum direct and indirect	**2,178 tonnes CO_2/year**

The reduction in direct emissions from the vehicles in the portfolio corresponds to 920,000 litres of gasoline saved per year.

5 Renewable energy

Hydropower is the clearly dominant power production solution in Norway and has been for over 100 years since the beginning of the industrialisation. Today, hydropower remains a crucial component of the national energy mix, accounting for 88 percent of the national electricity production in 2022. The same year, onshore wind accounted for 10 percent of the national power production[21].

Power production development in Norway is strictly regulated and subject to licencing and is overseen by the Norwegian Water Resources and Energy Directorate (NVE), a directorate under the Ministry of Energy. Licenses grant rights to build and run power production installations under explicit conditions and rules of operation. NVE puts particular emphasis on preserving the environment. The Norwegian part of the NVE homepage gives detailed information about different requirements for different kinds of projects[22].

Data about the assets are available from the Norwegian Water Resources and Energy Directorate (NVE), as all assets are subject to licencing.

5.1 Eligibility

The SpareBank 1 Nord-Norge's Green Product Framework includes the development, operation, and maintenance of electricity generation from solar power, wind power, geothermal power, and hydroelectric power.

The EU Taxonomy's "Do no significant harm" (DNSH) criteria for hydropower and wind, address environmental, social and governance (ESG) issues. The adaptation and resilience component in Climate Bonds Initiative (CBI) hydropower eligibility criteria and the DNSH criteria is in the Norwegian context to a large degree covered by the rigid relevant requirements in the Norwegian regulation of energy plants. All Norwegian wind power and hydropower assets conform to very high standards regarding environmental and social impact. Portfolio alignment with DNSH requirements has not been assessed in detail.

Hydropower

The green loan portfolio of SpareBank 1 Nord-Norge assessed in this report contains hydropower plants that meet the framework criteria as formulated as:

- The power density of the electricity generation facility is above 5 W/m^2
- The lifecycle emissions from the generation of the electricity are lower than 100 gCO_2/kWh

The eligibility criteria are formulated in line with CBI criteria[23], and the threshold is in line with the emissions threshold of 100 gCO_2e/kWh in the June 2021 EU Taxonomy Annex I to the Commission Delegated Regulation[24].

Hydropower plants with power density over 5 W/m^2 are exempt from the most detailed investigations.

For Norwegian hydropower assets, these criteria are easily fulfilled and most assets overperform radically.

- All run-of-river power stations have no or negligible negative impact on GHG emissions

[21] SSB 14091: Elektrisitetsbalanse (MWh), etter produksjon og forbruk, statistikkvariabel og måned, 2023
[22] https://www.nve.no/konsesjonssaker/konsesjonsbehandling-av-vannkraft/
[23] https://www.climatebonds.net/standard/hydropower
[24] https://ec.europa.eu/finance/docs/level-2-measures/taxonomy-regulation-delegated-act-2021-2800-annex-1_en.pdf

- Due to the cold climate, Norwegian reservoirs are not exposed to cyclic revegetation of impoundment, and hence the negative impacts on GHG emissions from these reservoirs are very small
- Hydropower stations with high hydraulic head and/or relatively small impounded areas have high power density

Wind power

The green loan portfolio of SpareBank 1 Nord-Norge assessed in this report contains onshore wind power plants that meet the framework criteria as formulated as:

- Onshore and offshore wind energy generation facilities and other emerging technologies, such as wind tunnels and cubes

According to the CBI wind eligibility criteria[25], onshore wind energy generation facilities are automatically eligible. All onshore Norwegian wind power plants in the portfolio thus fulfil this criterion.

5.2 Eligible assets in the portfolio

SpareBank 1 Nord-Norge's eligible assets have low to negligible GHG emissions related to construction and operation of the renewable power plants, something Multiconsult can verify.

SpareBank 1 Nord-Norge's portfolio contain wind power plants in the range of 7 to 41 MW and hydropower stations with capacities in the range of 2 to 23 MW. The hydropower plants are run-of-river plants or hydropower plants with small reservoirs and hence have higher power density of several thousand W/m^2 (ratio between capacity and impounded area) and are eligible for green bonds. The onshore wind power plants are also eligible.

5.3 Impact assessment- Renewable energy

5.3.1 CO_2 emissions from renewable energy power production

All power production facilities have a negative impact on GHG emissions. Instead of calculating the impact on GHG emissions for all, and most of them rather small facilities in the SpareBank 1 Nord-Norge's portfolio, we refer to The Association of Issuing Bodies (AIB). AIB is responsible for developing and promoting the European Energy Certificate System – "EECS".

AIB, as referred to by NVE[26], uses an emission factor of 6 gCO_2/kWh for all European hydropower in their calculations of the European residual mix. The value is based on a life-cycle analysis where all upstream and downstream effects in the whole value chain for power production are included.

In subsequent assessments, we are using the AIB emission factors for all assets, even though they are higher than factors in other credible sources. E.g. Østfoldforskning[27] has calculated the life-cycle emissions of Norwegian hydropower (all categories) to 3.33 gCO_2e/kWh. For the type of assets in the portfolio, with many run-of-river and small hydropower assets, the AIB emission factor is regarded as conservative in an impact assessment setting. The positive impact of the hydropower assets is 130 gCO_2/kWh compared to the baseline of 136 gCO_2/kWh.

[25] https://www.climatebonds.net/standard/wind
[26] https://www.nve.no/norwegian-energy-regulatory-authority/retail-market/electricity-disclosure-2018/
[27] https://norsus.no/wp-content/uploads/AR-01.19-The-inventory-and-life-cycle-data-for-Norwegian-hydroelectricity.pdf

The equivalent emission factor for wind power is by AIB set at 20 gCO_2/kWh. The positive impact of the wind power assets in SpareBank 1 Nord-Norge's portfolio is then 116 gCO_2/kWh compared to the baseline of 136 gCO_2/kWh.

5.3.2 Power production estimates

The renewable energy power plants in SpareBank 1 Nord-Norge's portfolio are quite varied in age. A large portion of younger plants add uncertainty to the future power production. Planned power production for the assets has been attained from the Norwegian Water Resources and Energy Directorate's hydropower database[28], wind power database[29] and licensing documents[30].

It is important to note that indicated power production capacity in the licensing documents do not necessarily represent what can realistically be expected from the plant over time. For hydropower, the hydrology is uncertain, and unfortunately often overestimated in early project phases. Also, production figures normally do not account for planned and unplanned production stops, due to accidents, maintenance etc. Research on small hydropower has shown that actual production often is more than 20 percent lower than the licensing/pre-construction figures. There is no equivalent evidence to claim the same mismatch for large hydropower or wind power.

5.3.3 New or existing Norwegian renewable energy plants

The eligible plants in SpareBank 1 Nord-Norge's portfolio have a planned capacity stated in licensing documents to produce about 971 GWh per year. In the impact assessment this has been adjusted to an expected 860 GWh based on research mentioned in the previous section. The available data from the bank and in open sources include:

- Type of plant
- Installed capacity
- Planned annual production

The planned power production for the assets has been attained from the Norwegian Water Resources and Energy Directorate's energy production databases or licencing documents. Due to the often-overestimated annual production in small hydropower, the impact for the 54 hydropower plants smaller than 10 MW is conservatively calculated by reducing the estimated production by 20 percent.

Table 16 shows the capacity, number of plants, estimated and expected production for the assets in SpareBank 1 Nord-Norge's portfolio.

Table 16 Capacity and production of eligible hydropower plants and wind power plants, estimated and expected production.

	Capacity	No. of plants	Total capacity	Estimated production	Expected production
Small hydropower	2 – 23 MW	57	247 MW	767 GWh/year	656 GWh/year
Wind power	7 – 41 MW	3	60 MW	204 GWh/year	204 GWh/year
Total		**60**	**307 MW**	**971 GWh/year**	**860 GWh/year**

[28] https://www.nve.no/energiforsyning/kraftproduksjon/vannkraft/vannkraftdatabase/, 2024
[29] https://www.nve.no/energi/energisystem/vindkraft/data-for-utbygde-vindkraftverk-i-norge/, 2024
[30] https://www.nve.no/konsesjon/konsesjonssaker/, 2024

Table 17 summarises the expected renewable energy produced by the eligible assets in the portfolio in an average year and the resulting avoided CO_2 emissions the energy production results in.

Table 17 Power production and estimated positive impact on GHG-emissions.

	Expected production	Reduced CO_2 emissions compared to baseline
Eligible hydropower plants in portfolio	656 GWh/year	85,303 tonnes CO_2/year
Eligible wind power plants in portfolio	204 GWh/year	23,641 tonnes CO_2/year
Total	**860 GWh/year**	**108,944 tonnes CO_2/year**